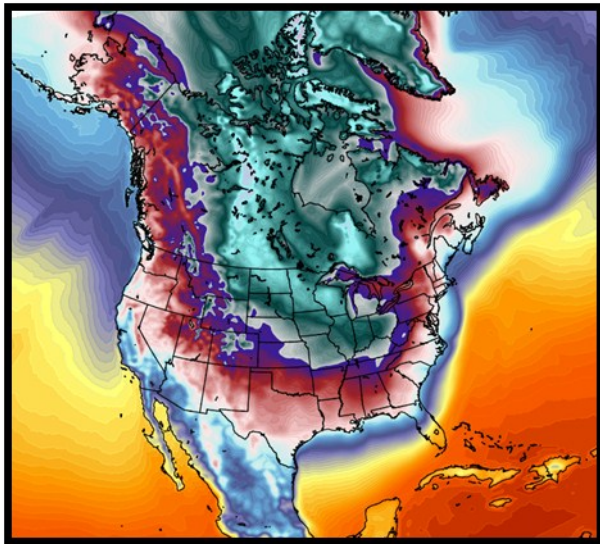




Winter Injury: “Are My Greens Still Alive?”

by Katie Dodson



Satellite image of the arctic vortex that brought extremely cold temperatures during the months of December 2013 and January 2014. So far this winter there have been 2 of these blasts.

With the winter conditions that have occurred during the past few months, winter kill is a topic on most of our minds. Questions arise like, “Did I put my greens to bed correctly?” “What is the proverbial ‘right’ way to prepare my greens and did I do that?”

Well if creeping bentgrass is your dominant species, you “should” be okay. But funny enough, we scientists don’t have all the answers when it comes to what is causing winter kill on putting greens.

There are a combination of things that contribute to winter injury. Because winter is long and variable most years, pinpointing only one fundamental cause has proven problematic. The factors that contribute to winter injury are:

- ✓ Prolonged ice cover leading to anoxia
- ✓ Winter diseases such as snow molds
- ✓ Direct low-temperature kill
- ✓ Early crown hydration
- ✓ Desiccation
- ✓ Winter traffic

What we do know about winter injury:

Ice Cover: Annual bluegrass can survive for approximately 45 days encased in ice, while creeping bentgrass can survive up to 150 days in ice (Thompkins et al., Crop Sci. 44:2175-2179). The primary cause of death with prolonged ice cover is anoxia or oxygen starvation. While the plants are dormant the crowns are still respiring at low rates, just like a bear hibernating in its cave. We can consider the ice to act as a barrier that prevents fresh air from reaching the crown causing a build-up of carbon dioxide which becomes toxic to the plant. Annual bluegrass is more susceptible to anoxic conditions because it does not harden-off to the same extent as creeping bentgrass.

Winter Diseases are generally under control due to reliable preventive fungicides that are on the market today. At this point in the season most of us are wondering how long the protection of our preventive fungicides will last. Typically if you are confident on the timing of your preventive applications most greens will come out of winter with minimal damage. As my father once said to me “nothing a little tickle won’t fix.”

Direct Low-Temperature Kill: Research out of the Prairie Turfgrass Research Centre and most recently from Univ. of Massachusetts (Hoffman et al., Crop Sci. 54:413-420) shows that annual bluegrass has a lethal temperature with 50% death (LT50) at approximately 0F (-17.7C), while creeping bentgrass has an LT50 between -6 and -16F (-21.2 to -27C). However long-term ice cover greatly sensitizes *Poa annua* to lethal temperatures, while only slightly altering that of creeping bentgrass.



Toronto ice storm
December 2013
(photo: J. Carson)

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Winter, continued

Early Crown Hydration is often considered the primary cause for most of the winter injury/kill we see. This occurs during late winter/early spring when the temperatures start rising and the crowns begin to uptake water. This is a critical period for turfgrass survival because as the crowns begin to take on water during the dehardening process, they become more susceptible to low-temperatures. We see that the lethal temperature rises closer to the freezing point (Thompkins et al., Agron. J. 92:5-9). If you have removed the snow/ice cover and/or winter covers you will need to consider spring tarps to help buffer the crowns from these extreme dips in temperature.

Desiccation is prominent on greens that receive a lot of direct sunlight and are exposed. While during the fall hardening process the crowns of the plants have expelled a lot of water, they are still respiring at low levels during dormancy. A primary ingredient in respiration is water, so if the crowns become too dry we will see winter kill from desiccation. Dave Minner at Iowa State performed a survey of golf courses in the early to mid 2000s and found that the next best thing to having a consistent season-long cover of snow was using tarps to prevent desiccation. Next best was winter watering, followed by heavy topdressing in the fall.

Winter Traffic: Whether caused by play, skiers, or animals winter traffic is harmful to turfgrasses. Minner (www.iowaturfgrass.org/research/2003winterinjury.pdf) found during the two winters of 2001-03 courses that allowed winter play tended to have severe injury in a 10-foot circle surrounding the pin.

Injury repair tips

Choose a new generation bentgrass, that has fast germination, and an aggressive growth habit that will rapidly fill-in your dead spots. **T-1** has been known to have a fast germination rate and a good fill-in rate.

Seeding method will affect the visual aesthetics and playability of the green at first. If you do not have access to a slit-seeder, your best option would be to aggressively verticut the area (preferably in two directions) followed by broadcast seeding, and then lightly cover the area with top dressing sand. This will ensure seed-to-soil contact and a greater establishment rate. Core aeration interseeding is another viable option however some people have reported circular growth patterns because the seed is only germinating in the aeration holes. To avoid this it would be best to break up the cores, then broadcast the seed, topdress, followed by matting the seed, topdressing sand and broken cores back into the canopy and the holes. The key is to space the tines close together to avoid large spaces between the holes. This will give a more uniform coverage of seed.



Winter kill on low-lying areas of the green. This green had permeable tarps, so water was able to pool and freeze in the low-lying areas under the tarp. (Photo: M. Grundman)

How to prevent future winter injury

Maximize Autumn Growth: Fall is the time to be optimizing turf health. During the fall we have two things going on: recovery from summer stress; and storage for the winter dormancy period. If the fall is droughty and hot, be sure to irrigate and relieve heat stress as much as possible, because excessive stress in the fall will reduce the crown's ability to acclimate during the hardening off process. Be sure to implement a good fertility program that is well balanced and promotes turfgrass growth. For example **Greens King 18-24** with micronutrients supplies a steady flow of nitrogen while promoting turfgrass recovery.

Locate Problem Spots: Interseeding newer generation bentgrasses will increase the winter hardiness of your greens, however no plant can survive under compacted, water-logged conditions. Locate the areas on your greens that have a tendency to pool water and discuss doing a complete renovation of this area to provide better growing conditions for your turf. Interseeding each spring will promote temporary turf cover, but long-term it would be better to consider reconstruction.

Consider Winter Covers: If you have greens that are exposed for most of the winter, then winter covers will decrease the chances of winter desiccation of the turf. The key to covers is to put them on as late as possible in the fall, so that the plants are in dormancy before covering them.

Why is *Poa annua* more susceptible to winter?

Creeping bentgrass expels more water from the crown during the fall, which concentrates the sugars in the crown. These sugars residing in the crown act as anti-freeze and prevent freezing damage to the crown, which is why creeping bentgrass can tolerate much colder temperatures than annual bluegrass. 🏌️